RESEARCH AND DEVELOPMENT, NEUCHATEL - QUARTERLY REPORT

DIVISION : RESEARCH

SUBJECT TITLE : DEIMOS

PERIOD COVERED : JULY - SEPTEMBER 1988

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KEYWORDS : ss, nicotine, tpm, co, single-cigarette

OBJECTIVE

Develop and evaluate the methodology for single cigarette routine determination of sidestream smoke TPM, nicotine and CO yields.

STATUS

Equipment

A four-port Borgwald smoking machine was ordered as a base of the future SS smoking set-up.

CORESTA Task-Force Studies

In the CORESTA ETS/SS task force meeting of June 16th in London [1] it was decided to do additional research on the method as proposed by BAT before a co-operative study is initiated. Among the points to be clarified, it was decided that the effect of flow rate on MS and SS yields would be investigated by our laboratory.

In the course of this study, different types of smoking chambers were tested in order to find out the influence of the chamber design on MS and SS tar, nicotine and CO yields.
The following chambers were used :
- PME chamber : an enclosed chamber
- BAT chamber : a bottomless chamber obtained from BAT
- BAT chamber with a deflector underneath the cigarette
- a chamber obtained from an external laboratory, identical to BAT except that it is wider.

The air-flow through the chambers was varied between 1 and 5 standard liters per minute (slpm).

The following comments can be made on the basis of the preliminary results obtained :

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Mainstream smoke

MS nicotine increases with increasing flow when open chambers are used. When using an enclosed chamber, the nicotine yield decreases with increasing air velocity.

MS CO and tar decrease with increasing air flow in nearly all chambers; only with the BAT chamber the CO remains constant.

Sidestream smoke

SS CO and tar yields decrease with increasing flow-rates in all chambers. Nicotine yields are only slightly affected.

Static burning rate

In all chambers, the burn rate of the smouldering cigarette increases rapidly with increased flow rate through the chamber until the rate of the freely smouldering cigarette is achieved. It then continues to increase, but much more slowly.

It should be noted, however, that this phenomenon is actually a function of the air velocity around the cigarette, and thus the free smouldering rate is achieved at a very low flow rate for the BAT chamber, but at a higher (1.5 slpm) flow rate for the chamber obtained from the external institute or the BAT chamber with deflector.

Conclusion

It appears that a fast removal of SS from the chamber, i.e. a flow rate of about 3-4 slpm for the BAT chamber, is needed to obtain the true MS values. It is shown, however, that this often implies that the air velocity around the cigarette will become excessive, falsifying the whole process. Thus, an alteration of the chamber configuration is needed, such as the use of a deflector, to obviate this problem. A screen above the cigarette could also be used to the same end, but it was found, in a separate experiment, to result in an excessive deposition and pyrolysis of tar on this screen.

PLANS
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Study the influence of cigarette filter ventilation on MS and SS yields with respect to the influence of flow-rate through the chamber.

Study the influence of flow rate through SS collection chambers on MS and SS aldehyde yields.

REFERENCE

[1] CORESTA SS and ETS Task Force Summary on main points from meeting on 16th June, 1988. Written by R.R. Baker (BAT, UK).